STANDARD ABBREVIATIONS

The list of abbreviations given below is not comprehensive; these abbreviations may or may not be incorporated into the Contract Documents and abbreviations not listed may be used. Periods may or may not be shown after the abbreviation.

Abbreviations are given usually for the singular case - for the plural case, the same abbreviation without adding the 's' may be used.

While upper case letters are shown, either upper case or lower case letters may be used in Specifications.

The following is listed alphabetically by the complete word, not by the abbreviation.

ABBREVIATION	COMPLETE WORD
ASD	Allowable Stress Design
ALT	Alternate
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ASCE	American Society of Civil Engineers
AWS	American Welding Society
&	And
∠	Angle
APPROX	Approximate
ARCH	Architect(ural)
@	At
@x	At x (length unit) on Center
B to B	Back To Back
BSMT	Basement
BM	Beam
BRG	Bearing
BET	Between
BLK	Block (as for steel beams)
BLKG	Blocking
BF	Both Faces
BS	Both Sides
BOT	Bottom
BLDG	Building
C, also [	Channel
CAM or C	Camber
CANTIL	Cantilever
CIP	Cast-In-Place (Concrete)
CLG	Ceiling
CTR	Center
CL	Center Line
CG	Center of Gravity
C TO C	Center To Center
CHAM	Chamfer
CLR	Clear(ance)
COL	Column
CJP	Complete Joint Penetration (Weld)
CONC	Concrete
CMU	Concrete Masonry Unit
CRSI	Concrete Reinforcing Steel Institute
CONN	Connect(ion)
CONSTR	Construct(ion)
CONSTR JT	Construction Joint
CONT	Continuous or Continue
CTRL JT or CONTROL JT	Control Joint
CORP	Corporation
CU	Cubic
CU FT or FT^3	Cubic Foot
CU IN or IN^3	Cubic Inch
CU YD or YD^3	Cubic Yard
D or DL	Dead Load
D	Deep, Depth
DEFL	Deflect(ion)
DEG, also °	Degree
DET	Detail
DIAG	Diagonal
DIA, also ø	Diameter
DIAPH	Diaphragm
DIM	Dimension
DO	Ditto
DN	Down
DWG	Drawing
EA	Each
EF	Each Face
EW	Each Way
E	East (also Modulus of Elasticity)
E-W	East-West
ELEC	Electric(al)
EL	Elevation
EQ	Equal
EQUIP	Equipment
EQUIV	Equivalent
EXIST	Existing
EXP JT	Expansion Joint
EXT	Exterior
FF	Far Face
FS	Far Side
FIG	Figure
F	Finish
FIN	Finish
FIN FL	Finish Floor
FIN GR	Finish Grade
FP	Fireproofing
FL	Floor, Floor Line
FT, also '	Foot
GA	Gage, Gauge
GALV	Galvanize(d)
GEN	General
GR	Grade, Grading
HT	Height
HEX	Hexagon(al)
H	High
HP	High Point
HOR	Horizontal
H	Horizontal (Force)
IN, also "	Inch
INCL	Include(d),(ing)
ID	Inside Diameter
IF	Inside Face
INT	Interior
JT	Joint
K	Kip
K-FT	Kip-Feet
KLF	Kips per Linear Foot
KSF	Kips per Square Foot
KSI	Kips per Square Inch
KO	Knockout
L	Length
LT	Light
LW	Lightweight
LIN	Linear
L or LL	Live Load
LRFD	Load and Resistance Factor Design
LLBB	Long Legs Back to Back (for angles)
LSL	Long-Slotted (Bolt Hole)
LP	Low Point
MFR	Manufacture(er)
MK	Mark
MATL	Material
MAX	Maximum
MECH	Mechanic(al)
MED	Medium
MEMB	Member
MEZZ	Mezzanine
MIN	Minimum
MISC	Miscellaneous
MC	Miscellaneous Channel
E	Modulus of Elasticity
M	Moment

ABBREVIATION	COMPLETE WORD
NF	Near Face
NS	Near Side
NEG	Negative
NOM	Nominal
NW	Normal Weight (concrete)
N	North
N-S	North-South
NIC	Not In Contract
NR	Not Reducible (Live Load)
NTS	Not To Scale
NO, also #	Number
OC	On Center(s)
OPG	Opening
OPP	Opposite
OVS	Oversize (round bolt hole)
OD	Outside Diameter
OF	Outside Face
OSL	Outstanding Leg
O TO O	Out To Out
PP	Partial Penetration Weld
PERM	Permanent
PERP, also ⊥	Perpendicular
PC	Piece
PC MK	Piece Mark
PL	Plate
PT	Point
LB	Pound
PCF	Pounds per Cubic Foot
PLF	Pounds per Lineal Foot
PSF	Pounds per Square Foot
PSI	Pounds per Square Inch
PRELIM	Preliminary
PROV	Provide(ision)
R	Radius
REF	Reference
REINF	Reinforce(d),(ing),(ment)
REBAR	Reinforcing Bar
RELOC	Relocate
REQD	Required
REV	Revise(d)(ion-s)
RD, also O	Round
SCHED	Schedule(d)
SEC, also "	Second
SECT	Section
SHT	Sheet
SLBB	Short Legs Back to Back
SSL	Short-Slotted (Bolt Hole)
SIM	Similar
SK	Sketch
SLOT	Slot(ted)
S	South
SPEC	Specification(s)
SQ, also ⌀	Square
SQ FT or FT^2	Square Foot
SQ IN or IN^2	Square Inch
STAG	Stagger(ed)
SS	Stainless Steel
STD	Standard
STL	Steel
STIFF	Stiffener
STRUCT	Structural
SDL	Superimposed Dead Load
SYM	Symmetry(ical)
T	Tee Section
TS	Tube (Structural)
TEMP	Temperature
TEMP	Temporary
THK	Thick(ness)
THRU	Through
TOL	Tolerance
TOC	Top of Concrete
TOS	Top of Steel
TYP	Typical
ULT	Ultimate
UL	Underwriter's Laboratory, Inc.
UON	Unless Otherwise Noted
VIF	Verify in Field
VERT	Vertical
V	Vertical (Reaction or Force)
WASH	Washer
WT	Weight
WWF	Welded Wire Fabric
W	West
W	Wide
W	Wide Flange
W	Width
W or WL	Wind Load
W/	With
W/O	Without
WP	Work(ing) Point
XXS	Double Extra Strong (Pipe)
XS	Extra Strong (Pipe)
YD	Yard
FY	Yield Stress (Steel)
Z	Zee

STRUCTURAL DESIGN CRITERIA

This structural design criteria of the project is for general information only and does not modify, alter or overrule the Specifications or the Contract Drawings.

A. CODES

The design meets or exceeds the requirements of the following codes. In some instances, the more stringent requirements have been applied where appropriate.

1. Building Code of the City of New York, 1993 and subsequent supplements.
2. *Load and Resistance Factor Design Specification for Structural Steel Buildings*, 1 September 1986, with Supplement No. 1, 1 January 1989, (*AISC-LRFD*), by American Institute of Steel Construction.
3. ANSI/AWS D1.1, 1990, *Structural Welding Code - Steel.*
4. ACI 318-89, *Building Code Requirements for Reinforced Concrete* by American Concrete Institute.

B. GRAVITY LOADS

The loads that follow do not include the weight of structural steel members. Normal weight concrete is taken at a unit weight of 150 pcf. Light weight concrete is taken at a unit weight of 117 pcf. Live loads are reducible except where noted NR (not reducible). The following are dead, superimposed dead and live loads taken for each occupancy category:

1. BULKHEAD FLOOR

	psf	Notes
Construction Dead Load		
- 4" lightweight concrete slab over 2" metal deck	53	
Superimposed Dead Load		
- fireproofing	2	
- finish	2	
- equipment allowance	-	(1)(3)
Total Superimposed Dead Load	4	(1)(3)
Total Dead Load	57	(1)(3)
Live Load	75 NR	(2)

2. BULKHEAD ROOF

	psf	Notes
Construction Dead Load		
- 1 1/2" roof metal deck	3	
Superimposed Dead Load		
- mechanical/electrical hung from below	10	(1)
- roof finish	20	
1 1/2" to 4" tapered insulation		
waterproofing membrane		
1 1/2" pavers		
Total Superimposed Dead Load	30	(1)
Total Dead Load	33	(1)
Live Load	40 NR	

3. FUEL OIL TANK ROOM ROOF

	psf	Notes
Construction Dead Load		
- 4 1/2" lightweight concrete slab over 2" metal deck	58	
Superimposed Dead Load		
- fireproofing	2	
- mechanical/electrical hung from below	10	
Total Superimposed Dead Load	12	
Total Dead Load	70	
Live Load	30	

4. BULKHEAD PERIMETER WALL

A wall load of 20 psf (of wall surface area) is considered around the Bulkhead. The framing of the Bulkhead Floor and the framing of the Bulkhead Roof are each designed to carry the full weight of the perimeter wall. The intermediate tube beam is designed to carry a 10 psf wall load (of wall surface area) between the beam and the Bulkhead Roof.

5. 5 WTC FUEL OIL LINES

a) Vertical Runs

The weight of 2" fuel lines, weighing 6 plf each, between the 5 WTC Roof and the 299 Level, are considered to be supported at the 299 Level. Fuel lines are enclosed by 8" CMU walls inside the shaft, weighing 55 psf (of wall surface area). Fuel pipe supports are provided at every floor.

b) Horizontal Runs

Two 2" fuel pipes inside an 8" SCH40 encasement pipe, all weighing 39 plf, are considered to be hung from the 5 WTC Roof (Floor 10), between the Generator Room and the riser shaft, and from the 299 Level, between the riser shaft and the Fuel Tank Room.

Vertical supports for the fuel lines are assumed to be at approximately 10 to 12 ft. on center.

The fuel line is considered to be enclosed by a 2 hour fire rated gypsum board enclosure, weighing approximately 40 plf, directly attached to the structure.

6. ELECTRIC CABLES

a) Vertical Runs

Armored cables, weighing 16 plf each, inside 5" rigid conduits, weighing 13 plf each, are considered in the riser shafts at 5WTC, 2WTC and 1WTC. The number of cables are shown in the Contract Drawings. Per JRLA, the total weight of cable and conduit (29 plf) is assumed uniformly distributed between all conduit supports in the run. Conduits are supported at every floor.

b) Horizontal Runs

Unless otherwise noted, cables, weighing 8 plf each, inside 5" rigid conduits, weighing 13 plf each, are considered to be hung from the existing structure. See Mechanical Drawings for routing of cables.
A 2" concrete encasement, weighing 85 plf for each conduit, is added where the encasement is indicated in the mechanical drawings. Vertical supports for the cables (and the encasement where required) are assumed to be at approximately 5 ft. on center.

7. FUEL OIL TANK ROOM

It is assumed that one tank may burst, causing the Tank Room to flood to a level of 2.8 ft. The CMU walls surrounding this room are capable of resisting the hydrostatic pressures associated with this flooding.

△1

Notes:

1. Actual equipment weights, as provided by JRLA, are added as summarized below. The indicated weights are the total maximum operating weights of the equipment, including base skids, attachments and the like. Except as noted, the equipment is supported by the Bulkhead floor framing. For location of equipment, see Mechanical Drawings.

Generator	42000 lbs
Radiator	9000 lbs
Silencer (2 per generator)	1400 lbs each*
Switchgear	25000 lbs
Load Bank	24500 lbs
Future 5WTC Tenant Substation	8000 lbs

* 80% of the weight is supported by the Bulkhead Roof. 20% is added to the Generators. One silencer per generator, weighing 2800 lbs, may be selected instead of the two indicated silencers per generator.

An 18" fuel oil header, weighing 202 plf and spanning north-south along the Bulkhead length, is considered to be supported from the Bulkhead Roof, just west of the exhaust of the silencers.

2. Omit Live Load at location of equipment considered in Note 1. Use 50 psf NR (Not Reducible) as aisle live load between generators.

3. To facilitate installation of the generators, the beams in the area east of the column line spanning between Columns E-10/21 and E-16/7 are designed to accommodate two generators per 30' bay located anywhere within the bay.

Note that the slab is not designed to span the weight of the generators to the beams. During installation, when the generators are moved around in the area indicated above, rigging beams need be placed on top of the slab to transfer the weight of the generators to the supporting floor beams.

THE PORT AUTHORITY OF NY & NJ

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CONSULTING STRUCTURAL ENGINEERS

I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF ONE OF THE CONTRACT DRAWINGS CONSTITUTING A PART OF CONTRACT NO. WTC-945.071 IN THE FORM IN WHICH SAID DRAWINGS EXISTED AT THE TIME THE SAID CONTRACT WAS EXECUTED BY THE PARTIES.

DATE 1/16/98 Sultan A. Aslam — SPEC WRITER

DATE 4/10/98 P.K. Juveaney — ENGINEER OF DESIGN

No.	Date	Revision	Approved
1	12/12/97	ADD FUEL OIL BURST LOAD	RZ
	11/17/97	ISSUED FOR BID	-

Engineering Department
Design Divisions

The World Trade Center

STANDBY POWER
5 WORLD TRADE CENTER

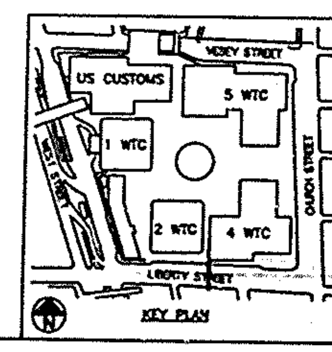
STRUCTURAL

SYMBOL LIST &
STRUCTURAL
DESIGN CRITERIA

Designed by	Drawn by	Checked By
MVS	CM	RZ

Date: 11/17/97 Scale:

Contract Number: WTC-945.071 Drawing Number: S0-01



KEY PLAN